

Steam The Best Solution For Science Teaching ? : A Review

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Abstract : *In the highlights of this study, researchers look at the development of science education from 1960 to 2017, teaching issues studied from students' perceptions, global science achievements, teacher practice, lack of teaching materials in STEM education (science, technology, engineering and mathematics) and the arts in primary school Science. In addition, this study will look at STEAM teaching with a focus on the definition, elements of STEAM, teaching theory, teaching strategies and assessment methods practiced in the STEAM teaching model. The last section discussed is past studies on STEAM.*

1. INTRODUCTION

In 2010 the country underwent such a great education curriculum change. Introduction of the Primary School Standard curriculum (KSSR) was introduced, KSSR is a curriculum design based on 6 pillars namely Communication, Spirituality, Human Attitudes and Values, Physical Development and Aesthetics, Science and Technology and Personal Skills. At this stage KSSR uses the Elements of Creativity and Innovation, Entrepreneurship and Information and Communication Technology (ICT) explicitly by focusing on 4M (reading, writing, counting and reasoning).

The importance of Science and Technology education in Malaysia has been recognized and accepted by all parties. This is evident in all the Malaysia Plans where Science and Technology education has been given significant emphasis. Primary school Science education is also not spared from undergoing changes to adapt to future plans.

According to the Primary School Standard Curriculum (2015) first year science subjects focus on thoughtful learning which involves scientific skills and thinking skills for the acquisition of applied knowledge through the main approach in science education which is inquiry. The same curriculum also aims to prepare students who will face the era of rapid technological development and the various challenges of the 21st century. The students who go through this curriculum will be a source of human resources in the field of science and technology that will contribute to the development of the country.

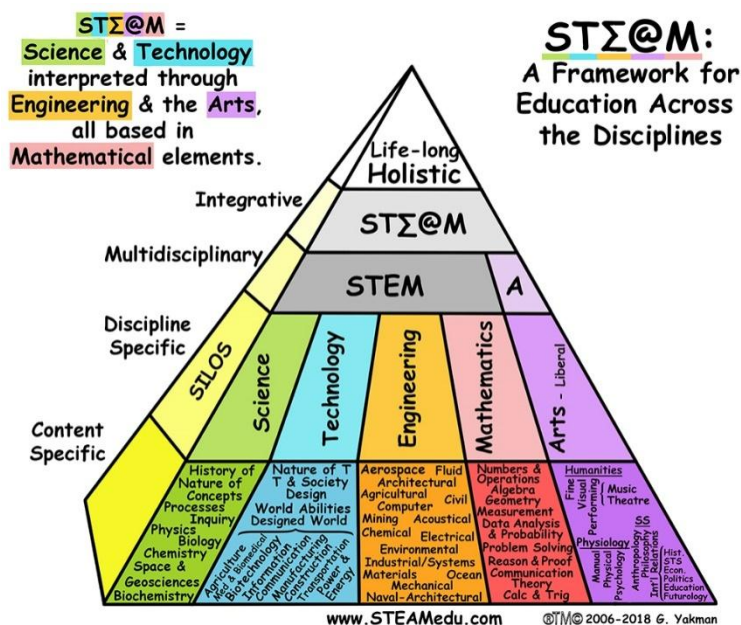
The knowledge and skills provided by the Ministry of Education Malaysia is expected to help produce students who have scientific abilities and become competitive citizens in the future. Nevertheless, efforts to improve the quality of science teaching and learning are constantly being enhanced and STEM education, which is education that integrates science, technology, engineering and mathematics subjects, was introduced in 2013.

2. LITERATURE REVIEW

STEAM was introduced by Yakman (2006). The STEAM education model is a model that is purified from the STEM education model. STEAM is an educational framework across various disciplines so that students can integrate various disciplines in daily life. (Yakman 2008). According to Maeda (2013) the acronym A which represents artistic includes several elements in art, namely:

- a. Fine arts - painting, coloring, music, acting and performance
- b. Language arts - communication and writing
- c. Physical arts - physical movement
- d. Liberal Arts (Social arts)- the relationship between humans and the environment.

For Office Congress Woman Suzanne Bonamici defines STEAM as teaching integrating art and design principles, concepts and techniques. Susan Riley (Art Integration Specialist) describes STEAM as a teaching approach that teaches students about dialogue, inquiry and critical thinking. From the definitions and characteristics discussed above according to Yakman (2010) STEAM is a teaching that uses multidisciplinary integration methods to solve everyday problems with. Pupils learn to communicate and collaborate between members. In addition STEAM aims to bridge the gap of existing knowledge with vocational knowledge so that these students can meet the needs of work in the future. The application of artistic elements can increase students' creativity and innovation.



The STEAM pyramid was built to help educators and students see the subjects involved in STEAM and the learning approaches practiced at each level. Understanding the framework is important for teachers to provide appropriate teaching plans and activities for their students. As for the students, they can clearly know the subject in each field. For example, the subject science fields involved are biology, chemistry, physics, biochemistry, geoscience and so on.

This knowledge allows students to know what fields they are interested in, the potential of each field and they can make plans for their future.

STEAM education is a complete educational model to be applied in teaching and learning in primary schools especially in first year science subjects. According to past studies, there are many benefits we derive from STEAM education. Among the benefits of STEAM education are:

a. STEAM can attract students in science subjects.

STEAM education can increase students' interest in science subjects in primary schools. This is because STEAM approaches such as using experimental teaching methods, simulations, projects, technology and visits allow students to learn through experience. For SurayaBahrum, Norsalawati and Nasir (2017) the STEAM approach can increase students' motivation towards science because teachers use an engaging and student-centered approach. Pupils who do the activity while the teacher is the facilitator.

Yakman (2008) integrated teaching allows students to carry out a variety of interesting activities. For example, in science teaching, students can also do art activities such as coloring, singing or acting. In addition, students can learn about mathematics in science activities by doing measuring and counting activities. Integration between subjects and principles will allow teaching and learning to take place in a more enjoyable environment.

Of further importance is that STEAM education can increase the creativity of students during the teaching and learning process. Jennifer Kite (2019) in the United States, they failed to produce a STEM-based workforce. This problem occurs because STEM places too much emphasis on science skills, principles and knowledge. Pupils are not given a chance to think. They only use the principles and knowledge learned in the field of work. This situation causes students to not have a high power of imagination and they are not creative. To address this problem, elements of the arts have been applied in STEM to help Americans train students so that students are trained to think creatively. Various STEAM activities such as invention and fine arts are conducted to enhance the students' ability to imagine.

In addition, Gonski (2018) children need to learn the basics of 3M namely reading, writing and counting. Therefore, STEM needs to be combined with the arts to create a comprehensive curriculum. This is because the business and publishing industries need employees with a wide range of skills. Through STEAM which is an integrated curriculum, students are able to create continuity of concepts and problem solving in a variety of ways. The difference between STEM and STEAM is that STEM focuses on scientific concepts. STEAM integrates creativity in scientific concepts. For example, collaborating to create a product or object based on STEM concepts.

The value of collaboration is the value of art that is the ability to collaborate and interact in groups. Therefore, STEAM is important in ensuring that creative students can be born and can solve problems while they work the class. These skills will be able to guarantee in an effort to provide a multi-skilled workforce in the 22nd century.

Margeret E, Marsha (2013) STEAM education using a multidisciplinary approach by combining the arts and humanities in STEM can produce a creative workforce in the future. Through STEAM education, the art of training students to think divergent, that is, creative

thinking for the purpose of problem solving. Through STEAM teaching activities such as making experiments to solve problems, then students will be more creative in the future. From the above studies, the researchers found that STEAM education is a good educational model to produce creative students, especially school children in Malaysia.

In STEAM education, one of the key features is to encourage collaborative teaching. Collaboration in the teaching and learning process can train students to be tolerant, cooperative, always respect others and the environment and understand the concept of socializing. Nicole Radzinwill (2015) STEAM can help improve social relationships among students through active learning through questioning and discussion activities. Christine (2016) transdiscipline through STEAM can help solve problems in society. Various inventions such as technological and scientific innovations can ease the burden of society while doing work. For example, humans use robots to perform daily tasks such as sweeping, sending and picking up goods and discussing. These changes are a result of STEAM education.

3. DISCUSSION

Many STEAM studies have been found to improve the learning abilities of science subjects. Guy A. Boy (2013) teachers cannot teach using monodisciplinary methods instead they need to teach by integrating to produce rational and creative students. Through art, students learn through action (learning by doing). Pupils express, critique, explore and understand complex systems. With this method, students will better remember what they learned as they learn through experience.

Teaching that integrates the arts can also provide fun learning for students. Henriksen (2014), learning to use arts such as singing and acting can encourage students to actively learn in the classroom. The participation of students in activities in creating a happy atmosphere as well as students can learn the content of the lesson effectively.

For example, in science, the topic of the food chain, students act out to be plants, goats, and tigers. The acting students aim to show the connection between life. This way of acting will be able to apply the value of daring to try and be confident. From one lesson, a variety of knowledge, values and skills can be applied. In addition, the quality of science teaching can also be improved.

Piro (2010) STEAM integrates the arts in the STEM curriculum can help students explore STEM concepts. Tarnoff (2010) STEAM with the arts can help strengthen the foundation of science. Pupils use a variety of ways to produce their products based on science concepts through art. From this opinion, the researchers found that the arts can help improve STEM achievement at the primary school level.

4. CONCLUSION

Art skills are directly related to science teaching skills especially of students in primary schools. The combination of arts and STEM has produced a more perfect teaching known as STEAM. Through STEAM students can learn science in a more interesting, fun and easy way to remember science facts.

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